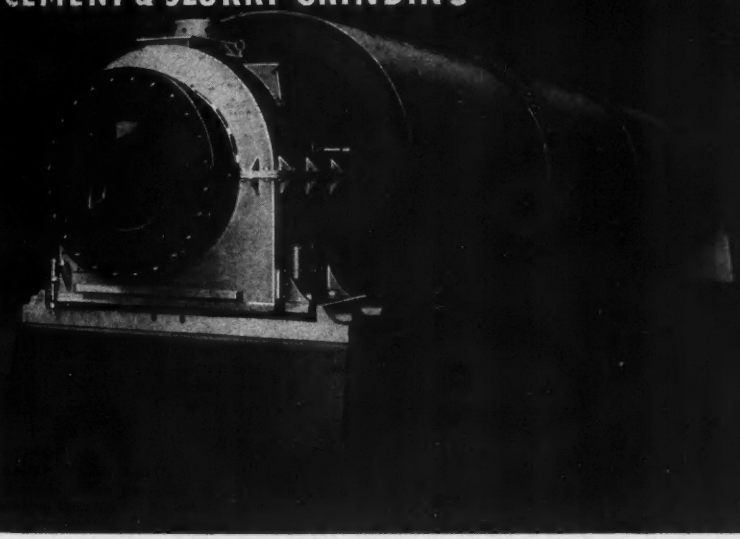
CEMENT AND LIME MANUFACTURE

691

XXVI. No. 5 SEPTEMBER, 1953 Price 1s. Annual subscription 6s. ($1.30 in Canada and U.S.A.)

CEMENT & SLURRY GRINDING



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1 Mill End-plates made from heavily-ribbed rolled steel discs, thus eliminating completely cast steel or cast iron End Covers which are liable to crack or break in service.

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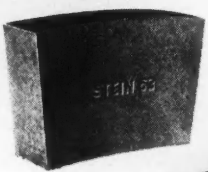

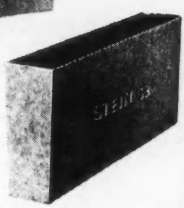

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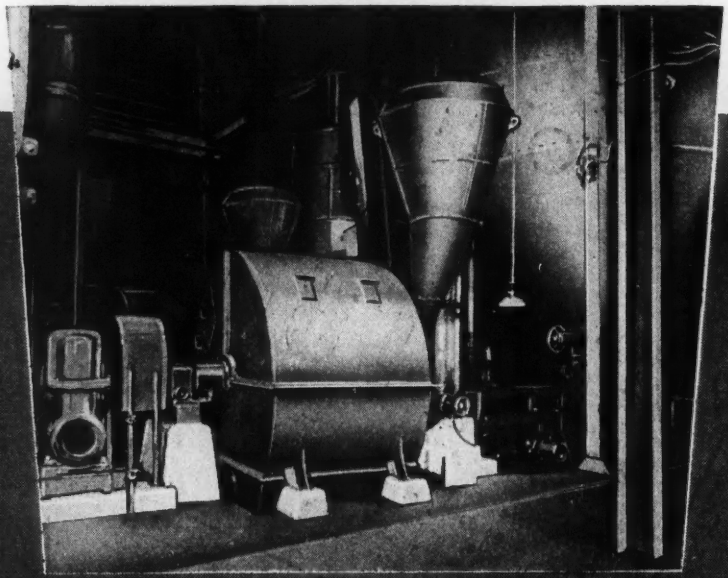

Illustration shows two of three British "Rema" Unit-firing central-shaft Ball Mills installed in a British cement factory. Each mill is driven through a totally-enclosed worm-reducer, direct coupled to the main shaft of the mill.

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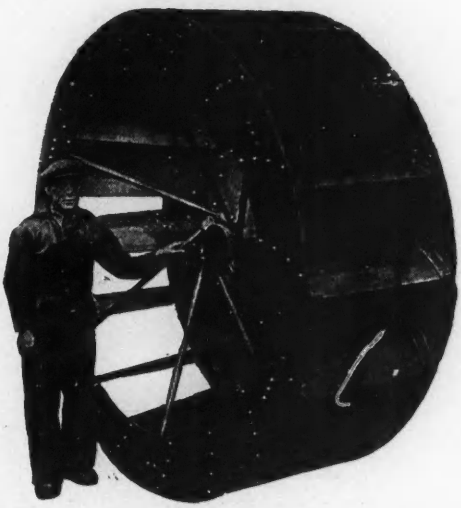

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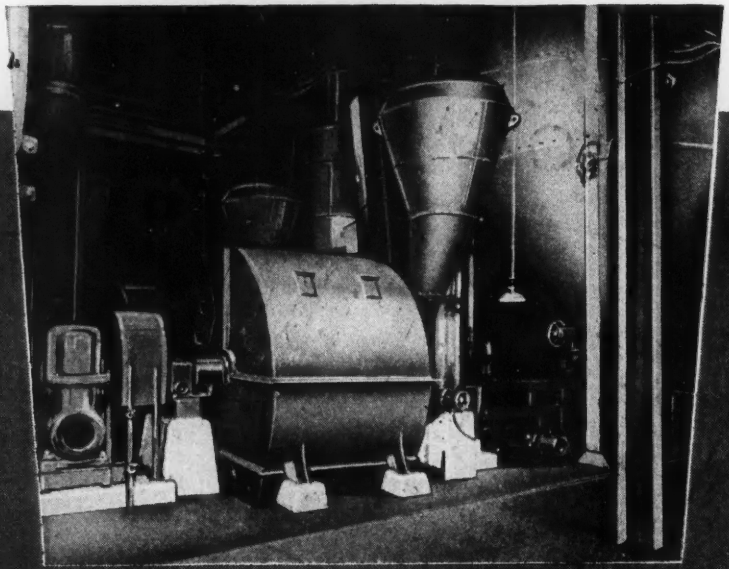

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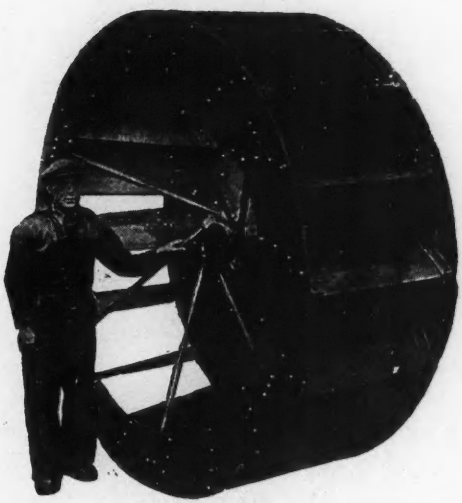

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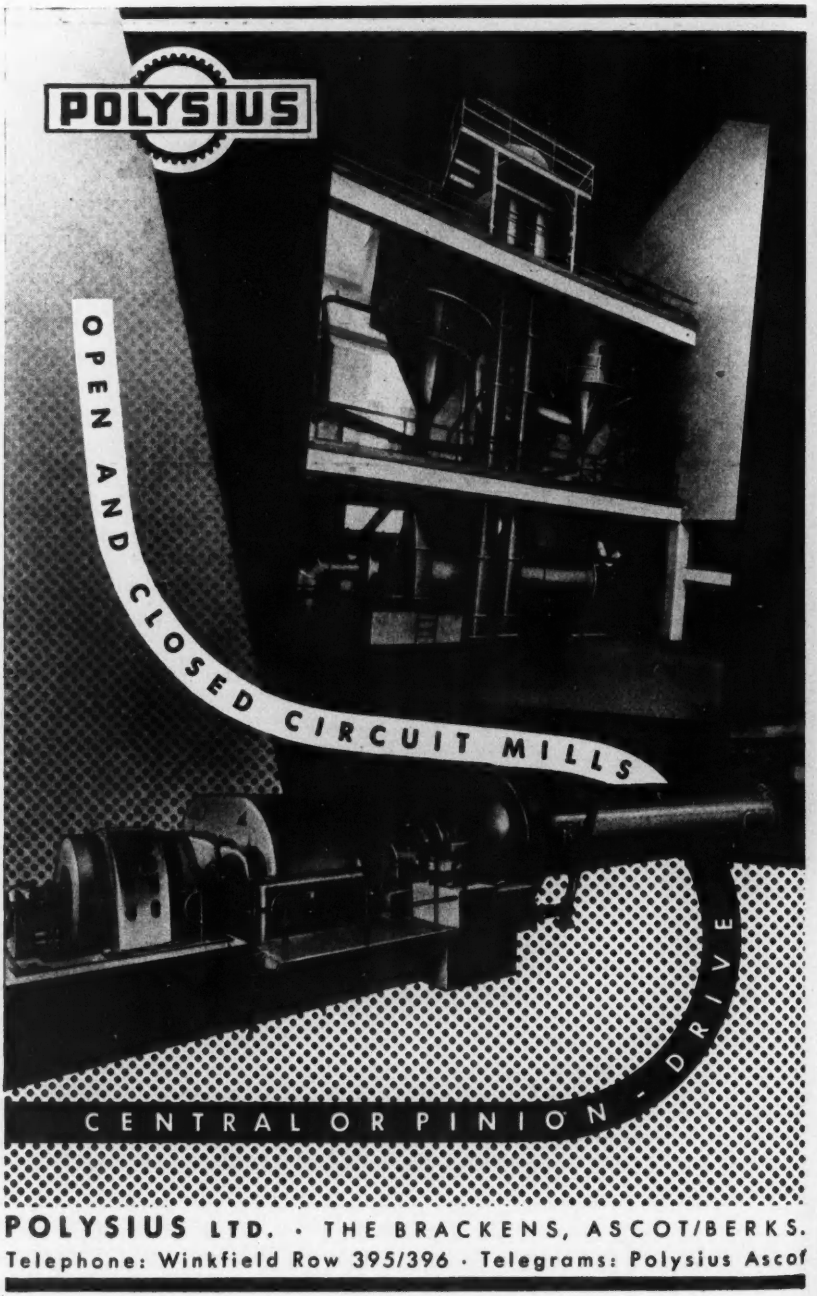
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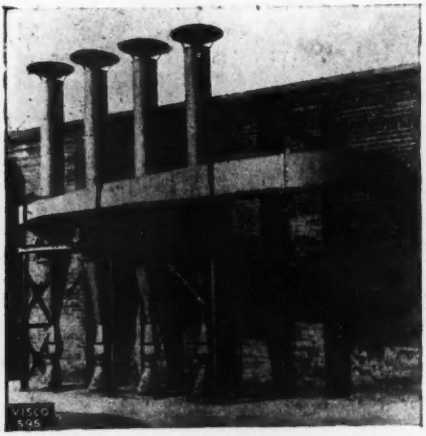

Battery of four "Visco" High Efficiency Cyclones recovering dust produced by file grinding process at the works of Messrs. Firth Brown Tools Ltd., Sheffield.

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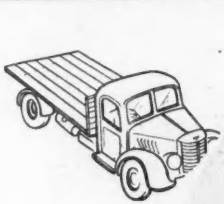

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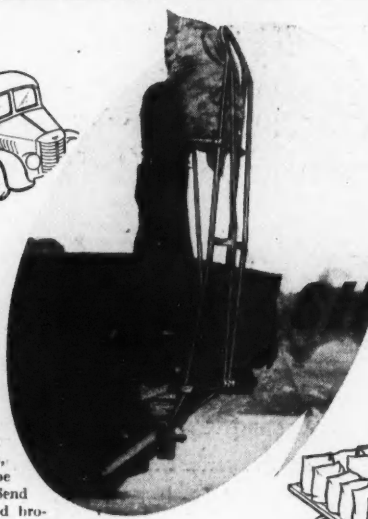

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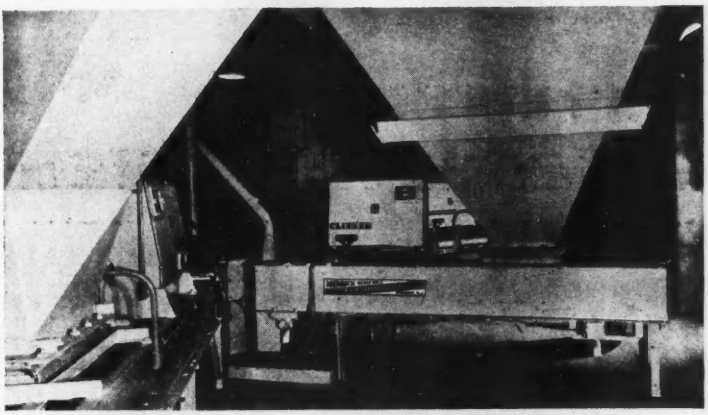

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Cemento de Mixcoac, like most major cement producers, select Merrick Feedoweights to feed, blend, and proportion basic cement components such as Clinker, Gypsum, Limestone, Shale, Sand, Iron Ore, etc.

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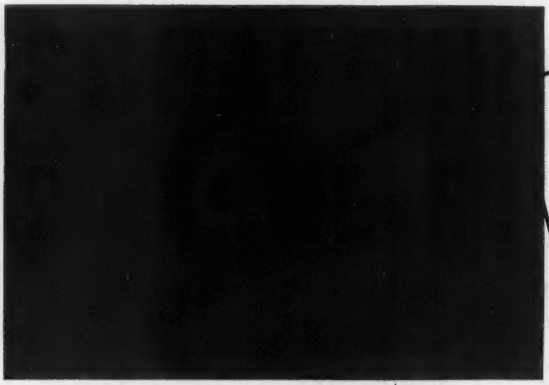

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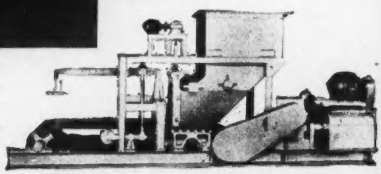
MIXCOAC
CEMENT
WORKS



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Selected in Expansion of CEMENTO DE MIXCOAC, S.A.

Illustrated here is a typical Nordberg Grinding Mill for the cement industry, similar to the 7ft. 3in. diameter by 40ft. unit installed at the Mixcoac Cement Works.

The recent extensions of plant and machinery for CEMENTO de MIXCOAC, S.A., included the installation of a 7ft. 3in. diameter by 40ft. Nordberg Grinding Mill.

This is just one typical example of the way in which Nordberg machinery is serving the cement industry throughout the world.

Nordberg machinery built for the Cement industry includes "SYMONS" gyratory Crushers for primary crushing of raw materials; "SYMONS" Standard and Short-head Crushers for preparation of finely, uniformly sized raw-mill feed; "SYMONS" Vibrating grizzlies and screens for saalping and sizing; wet and dry grinding ball, tube, and compartment mills; rotary dryers, kilns, and coolers; and Nordberg Diesels in sizes from 10 h.p. to more than 10,000 h.p. to meet practically every power requirement.

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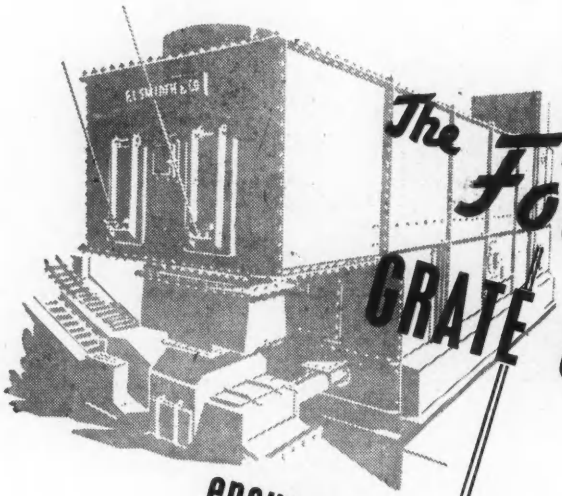

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ensures flexible kiln operation...

The amount of air penetrating the bed of the FOLAX GRATE COOLER can be adjusted independently of the amount of air required for the burning in the kiln, and the cooler and kiln speeds are independent of one another.

Other features are efficient heat recuperation, air quenching, effective cooling permitting immediate grinding, low head room, low power consumption and small maintenance cost.

The FOLAX GRATE COOLER—the cooler with horizontal grate and positive conveying of the clinker—is supplied by :

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PUBLISHED ALTERNATE MONTHS. PRICE 1S. A COPY. ANNUAL SUBSCRIPTION 6S. POST FREE. $1.30 IN CANADA AND U.S.A

PUBLISHED BY
CONCRETE PUBLICATIONS LIMITED
14 DARTMOUTH STREET, LONDON, S.W.1.
TELEPHONE: WHITEHALL 4581.
TELEGRAPHIC ADDRESS: CONCRETIUS, PARL, LONDON.

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VOLUME XXVI. NUMBER 5. SEPTEMBER, 1953

Extensions of a Cement Works in Mexico.

THE Mixcoac works of Cemento de Mixcoac commenced operation in 1931 with one Allis-Chalmers rotary kiln of 200 metric tons daily capacity. A daily output of 250 tons was achieved, but as the demand increased a Lepol kiln of 200 tons capacity was installed and started to operate in 1940 and a third kiln (by Allis-Chalmers) was installed in 1944. The present capacity is 700 tons a day. A plan of the works is given in *Fig.* 4 and a flow diagram in *Fig.* 2.

Grinding.

To provide sufficient grinding capacity when the second kiln was installed, the existing two Allis-Chalmers Compeb mills were each put into closed circuit with a 16-ft. Sturtevant air-separator. This enabled all the clinker produced by

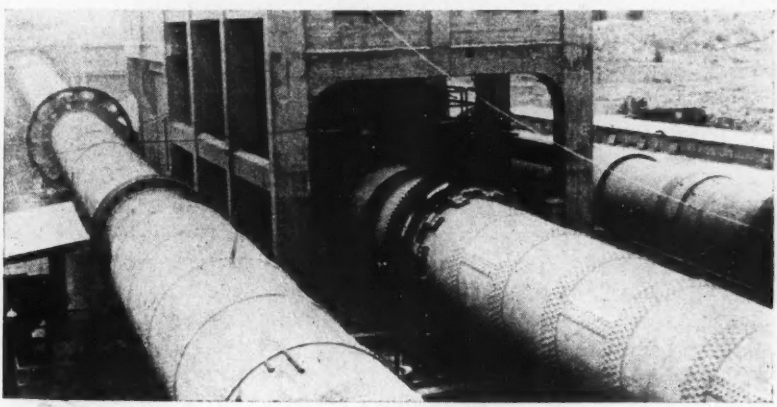


Fig. 1.—The Kilns.

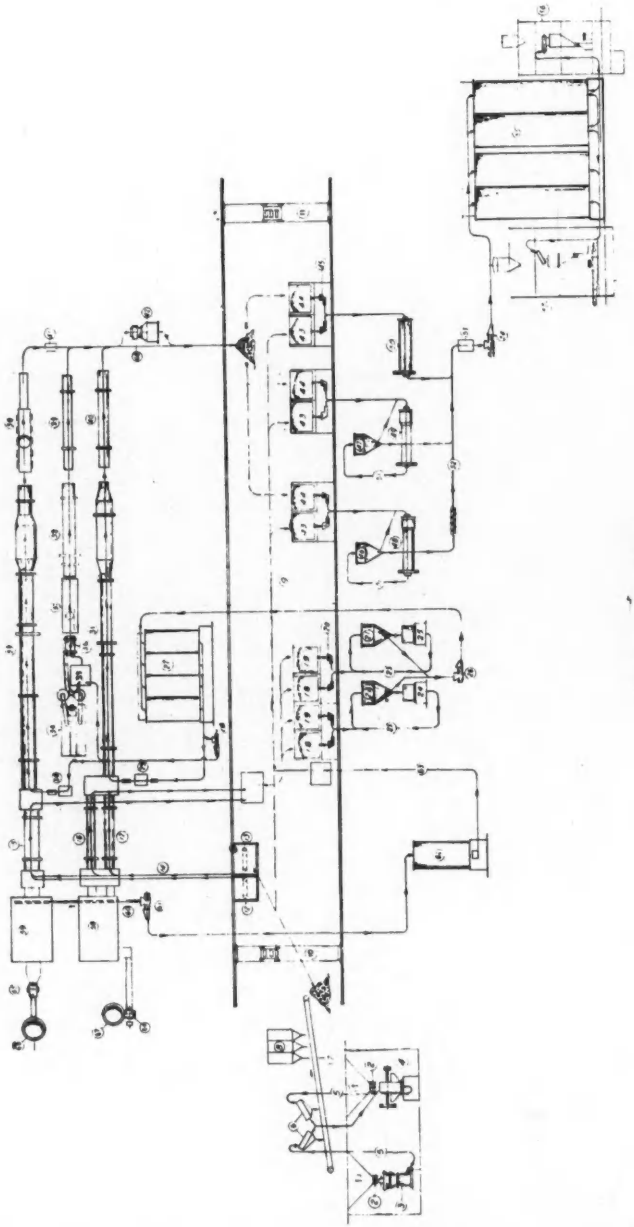


Fig. 2—Flow Sheet.

the two kilns to be ground, but it was necessary to install an additional raw grinding mill. A Babcock & Wilcox No. 360 type B mill of the ball-bearing type was installed, and started operation in 1941. By that time the demand for cement was so pressing that a second mill of the same type was ordered and a new kiln was ordered from the Allis-Chalmers Company, but this installation was not finished until 1944. In 1947 a 700-h.p. compartment mill (by Ernest Newell & Co., Ltd.) was installed, and in 1952 an 800-h.p. Nordberg mill was added to enable the works to produce high-early-strength cement, masonry cement, and other special cements. The three kilns are shown in *Fig.* 1.

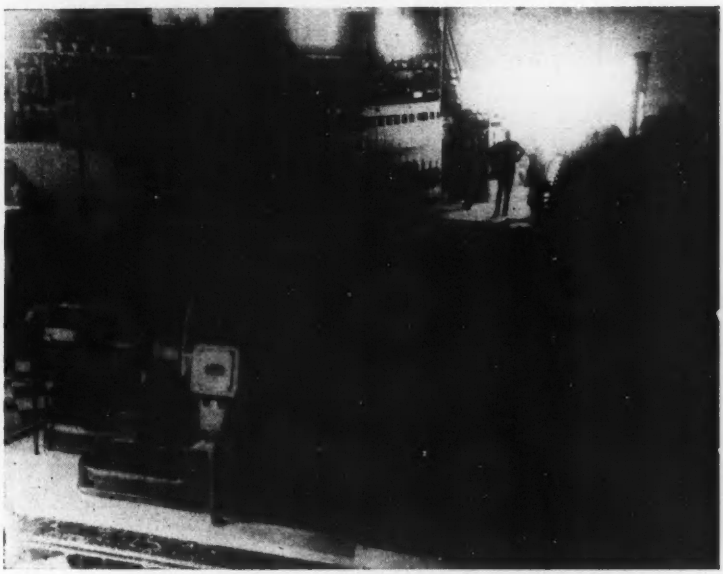
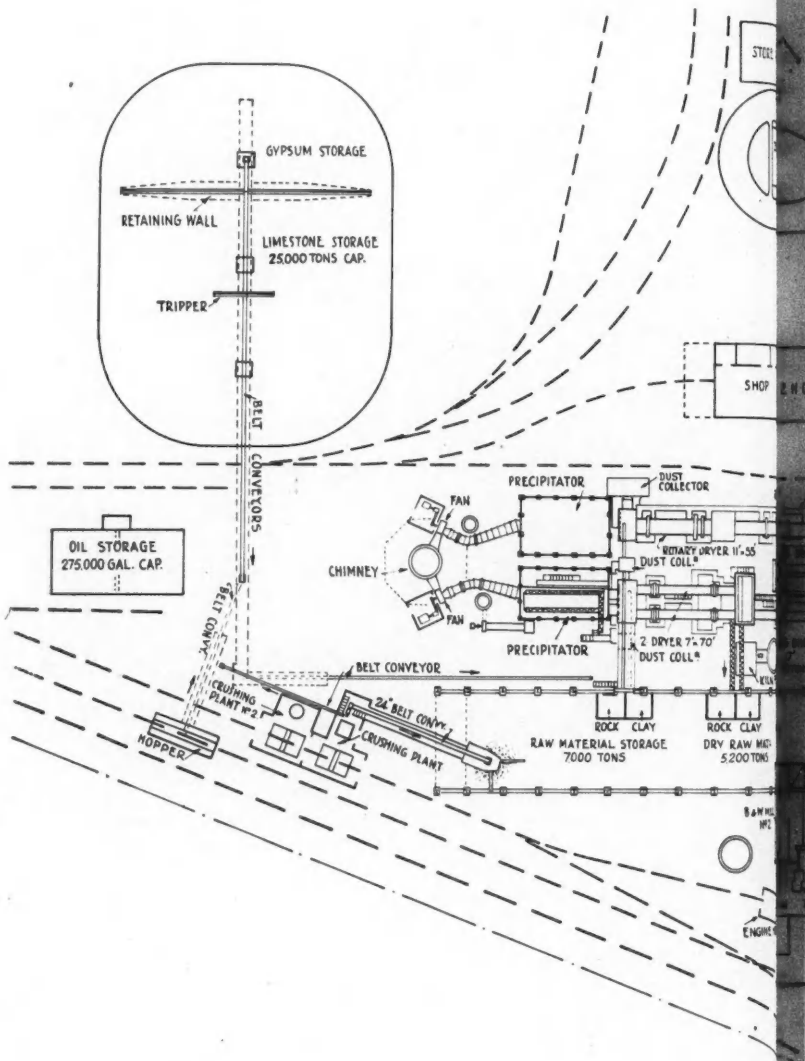


Fig. 3—Sub-station and Mill-motor Room.

The two Babcock & Wilcox mills pulverize all the raw mixture and one of the old Allis-Chalmers mills has been arranged so that it can be used for raw or finish grinding. The Babcock & Wilcox mills are driven by a 500-h.p., 6000-volts, G.E.C. synchronous motor and work in closed circuit with a 16-ft. Sturtevant air-separator. These mills work with a very high circulating load, and a bucket-elevator of 700 tons per hour capacity carries the circulating load and the fresh feed to the separator. The elevator was made by the Chain Belt Company (U.S.A.). The Newell mill is used for finish grinding and is 7 ft. 3 in. diameter by 36 ft. long. It is divided into three compartments; the first two chambers are lined with manganese plates and the third with hard white iron bars. It is driven by a 700-h.p. synchronous motor by Crompton Parkinson, Ltd. The latest mill installed was supplied by the Nordberg Manufacturing Co. (U.S.A.); it is 7 ft. 3 in.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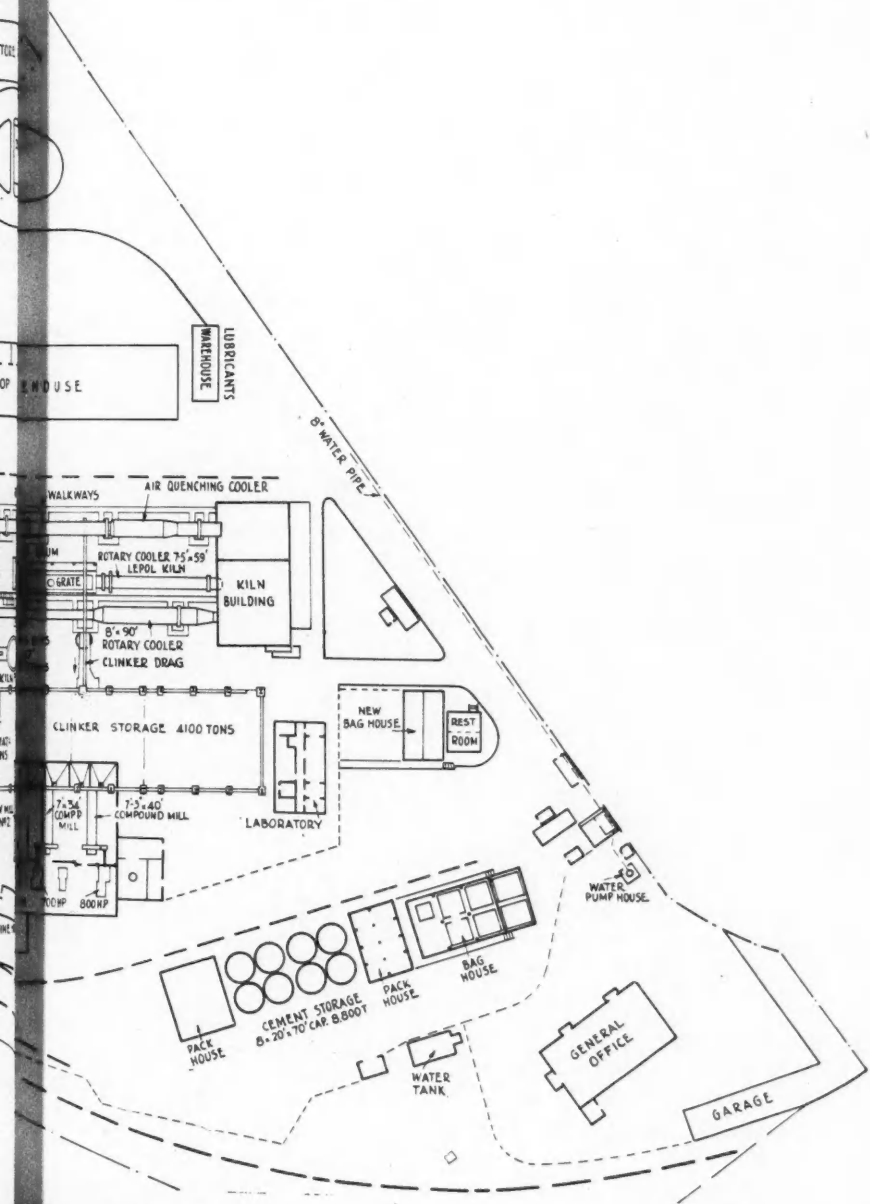
24" BELT CONVY.
CRUSHING PLANT
HOPPER
ROCK
CLAY
ROCK
CLAY
RAW MATERIAL STORAGE
7000 TONS
5200 TONS

Fig.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8-20'×70' CAP. 8,800T
PACK HOUSE
WATER TANK
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ment Works.

diameter by 40 ft. long, and is used also for grinding cement. It has three compartments and in the first two chambers are Lorrain forged steel liners ; it is driven by an 800-h.p. G.E.C. motor through a Falk speed-reducer and a Cutler-Hammer magnetic clutch. The mill motors are shown in *Fig.* 3.

The two Babcock & Wilcox mills are provided with poidometer feeders, which are automatic scale-conveyors made by the Schaffer Poidometer Company (U.S.A.). The feeders of the Newell and Nordberg mills (*Fig.* 5) were supplied by the Merrick Scale Manufacturing Co. (U.S.A.). Each mill has one Feedo-weight for gypsum and one for clinker.

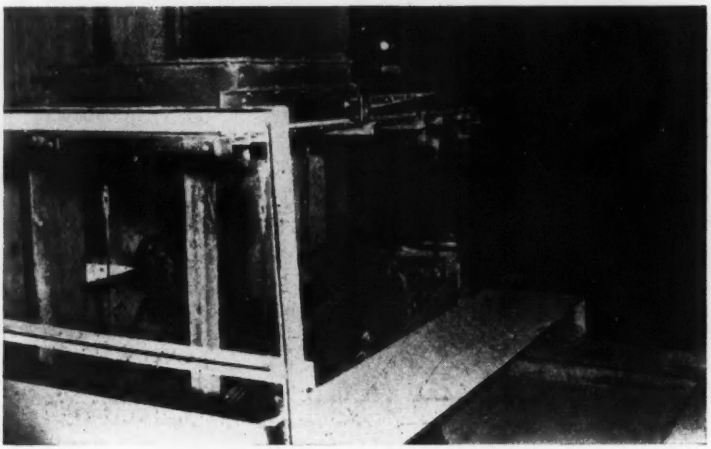


Fig. 5—Clinker Weigher, Kiln No. 3.

Dust Collection.

Each of the six mills has its own dust-collector (*Fig.* 6) of the bag type with automatic shakers made by the Northern Blower Co. (U.S.A.). These collectors act at the outlet and inlet ends of the mill as well as on the conveyor system. In the rainy season the Babcock & Wilcox mills are supplied with hot air to remove the remaining moisture in the material and to keep the dust-collecting lines and the filter-bags clean and dry.

The Kilns.

The Lepol kiln is 9 ft. 3 in. diameter by 92 ft. 6 in. long, with two cast-steel tyres. It is driven by a 35-h.p. Westinghouse slip-ring variable-speed 440-volts motor, of 500 to 750 r.p.m., with a rope drive through a reduction gear and girth gear, giving the kiln a maximum speed of 60 revolutions per hour. The kiln is fed with pre-calcined nodules by a Lepol grate 7 ft. wide by 33 ft. long. The grate is driven by a 7½-h.p. variable-speed, 230-volts, direct-current Westinghouse motor of 375 to 750 r.p.m. through a multiple-worm gear-reducer and flexible

coupling. The dry ground raw mixture is nodulized with about 15 per cent. of water in a granulating drum 7 ft. 6 in. diameter by 14 ft. 3 in. long, supported by two steel tyres and driven by a 35-h.p. 440-volts Westinghouse slip-ring motor of 400 to 750 r.p.m. The raw mixture is fed to the granulating drum by a spider-feeder with flexible vanes driven by a 3-h.p., 230-volts, direct-current, variable-speed motor. Water for granulation is added from a constant-level tank through a perforated pipe inside the granulating drum. The clinker is passed to a rotary cooler 7 ft. 6 in. diameter by 60 ft. long, arranged under the kiln and supported on two tyres. A lifting system is incorporated in the cooler to obtain an equally-distributed curtain of falling clinker in order to obtain efficient cooling from the incoming air. The cooler is driven by a 20-h.p. 440-volts Westinghouse motor. The kiln is fired with Mexican crude oil through a mechanical atomizing-type burner. Induced draught is provided by a Polysius fan, driven through a flexible coupling by a 100-h.p. variable-speed 230-volts direct-current motor of 600 to 1000 r.p.m. and discharged to the steel chimney.

Fig. 6—Dust Collectors on Mill Building.

The kiln-control and indicator panel was supplied by the Polysius Company. The kiln, cooler, and grate motors, as well as all the oil-burning equipment, are controlled from this panel, on which are also temperature indicators and recorders, draught indicators, and special signal devices. This kiln was originally installed without a dust collector, as it was thought that the grate would act as a sufficient collector, but, as the raw material used has very little plasticity, the nodules on the grate burst and produce a great deal of dust. In 1943 dust-collecting equipment was purchased from the Northern Blower Company. The temperature of the exhaust gases is about 100 deg. C., and this made possible the use of bag-type collectors which work with an efficiency exceeding 99 per cent. The equipment consists of two 14-ft. H.E.L.S. " Norblo " cyclone collectors and two No. 780 " Norblo " steel-case bag-type automatic dust arresters 55 ft. long, each consisting of 20 compartments with 78 bags per compartment, with automatic air shakers. The necessary additional draught is provided by a " Norblo " double-inlet H.S. fan, driven by a 150-h.p. motor. An electric alarm calls the attention of the burner when the temperature approaches danger point for the bags.

Kiln No. 3 (*Fig. 7*) was supplied by the Allis-Chalmers Company, and is 300 ft. long by 9 ft. 6 in. diameter with an enlarged burning zone of 11 ft. diameter. The kiln has a slope of $\frac{3}{8}$ in. per foot and is of all-welded construction carried on five tyres. It is driven by a 105-h.p., 440-volts, variable-speed, brush-shifting motor, supplied by the A.S.E.A. Company of Sweden. The speed is 20 to 80 revolutions per hour, through a No. 12 D.A. Falk herringbone-type speed-reducer. The girth-gear is welded with cut teeth. The kiln is fired with Mexican crude oil through an Allis-Chalmers oil-atomizer at 300 lb. pressure. Atomizing air is

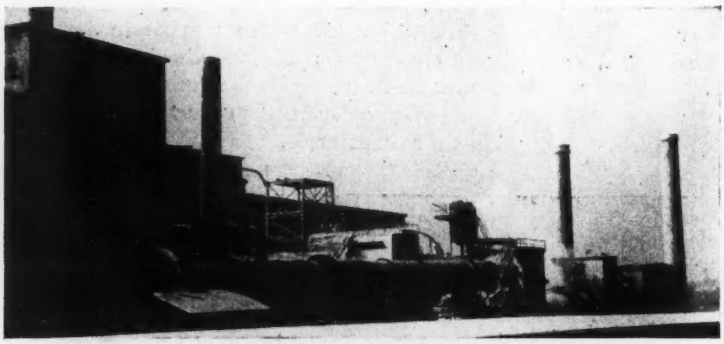


Fig. 7—Kiln No. 3 (300 ft. long).

Fig. 8—Air-quenching Cooler.

provided by an Allis-Chalmers turbo-blower with a capacity of 7000 cu. ft. per minute at 5000 r.p.m., and the machine is driven by a 100-h.p. Allis-Chalmers motor. A 25-h.p. vertical fire-tube boiler supplies the steam for preheating the oil. The raw mixture is fed to the kiln by a 12-in. double-screw feeder synchronized with the speed of the kiln.

The Allis-Chalmers cooler (*Fig.* 8) is of the air-quenching type. It is 4 ft. 6 in. wide by 60 ft. long, consisting essentially of a reciprocating grate of slotted construction over which travels the clinker to be cooled. Cold air is blown through

Fig. 9—Cement Silos and Packing House.

the grate from the duct beneath it and passes through the bed of agitated clinker, producing rapid quenching and cooling. The material is conveyed over the grate with a reciprocating motion. Most of the heat from the clinker is returned to the kiln with the secondary air of combustion. The cooler is driven by a 10-h.p. 220-volts variable-speed direct-current motor with an automatic speed-control to compensate for variations in feed, and also an automatic-combustion air-flow control.

The cooling-air is supplied by two Sturtevant fans, one with a capacity of 1100 cu. ft. per minute and one of 21,000 cu. ft. per minute, driven through vee-belts by a 25-h.p. 1000 r.p.m. motor. The clinker enters the cooler at a temperature of about 2000 deg. F., and has a temperature of about 180 deg. F.

when it is discharged. The combustion gases leave the kiln at about 1200 deg. F. and are introduced into a waste-heat rotary dryer, 11 ft. 6 in. diameter by 55 ft. long, where the crushed raw materials are dried by the kiln gases. The gas leaving the dryer has a temperature of about 500 deg. F. and passes through a Cottrell electrostatic precipitator which extracts the fine particles. The precipitator has three electrode chambers arranged so that any chamber can be shut for maintenance while the other two are in operation. The gases are drawn through the precipitator by a 100-h.p. Sirocco fan supplied by the American Blower Corporation, and the draught is controlled by a louvre damper electrically operated from the burner's platform.

Due to the high temperature and large amount of dust, the electrostatic precipitator was not sufficient. Van Tongeren cyclones supplied by the Buell Engineering Company (U.S.A.) have been installed ahead of the Cottrell precipitator; it is expected that the combined efficiency of collection will exceed 99 per cent. The induced-draught fan was replaced by a 110-in. Keith Blackman fan driven by a 180-h.p. slip-ring motor supplied by Crompton Parkinson, Ltd. The Allis-Chalmers kiln-control and indicator panel has all the electric, temperature, oil, and draught control instruments on the burner's platform.

To handle the increased quantity of materials, the crane yard was extended and another overhead grab-bucket electric crane installed. This is a duplicate of the first crane of 7½ tons capacity made by the Harnischfeger Corporation (U.S.A.). For the extra shunting service a 45-tons G.E.C. Diesel-electric locomotive was purchased in 1947.

The cement-storage capacity was increased by building four more silos of 1000 tons capacity each (*Fig.* 9), giving a total silo capacity of 8800 tons. Two new packers of the four-tube type have been supplied by the St. Regis Paper Company.

Removing Clinker Rings from Kilns.

THE Remington Arms Company of the U.S.A. has developed a gun for the removal of rings formed in cement, lime and other kilns. The gun weighs 92 lb. and fires 8-gauge shells. The projectile weighs 3 oz., and has an energy of 3½ ft.-tons at the muzzle. The projectile is made of lead so that it will not damage the kiln lining and will volatilise due to the heat of the kiln. It is reported that by this means rings can be removed with a loss of production time of six minutes only and with negligible loss of heat. It is stated by the makers of the gun that in one case the use of this gun reduced from 42 hours to 2½ hours every three weeks the time a kiln was stopped for the removal of rings. In another case the kiln was stopped for 15 minutes when the gun was used compared with eight hours when a poke-bar was used. A 12-gauge rifled slug fired from a 12-gauge shotgun has been effective in breaking balls formed too close to the entrance of the kiln to permit the use of the industrial gun.

A Belgian Cement Laboratory.

The research department of S.A. Cimenteries et Briqueteries Réunies was set up at Brussels in the year 1950, and is now in full operation. In addition to a library and an information department there are laboratories for research and for testing. The fundamental research department is investigating raw materials, the burning of cement slurry, the formation and prevention of rings in rotary kilns, the grinding of clinker, and refractory materials. The chemical section is equipped for investigating colloidal and analytical chemistry and analytical methods.

In the physical section, in addition to the usual apparatus, there are a Leeds & Northrup polarograph for direct recording fitted with an ultra-thermostat for the rapid determination of iron, alumina, and silica ; a Lumetron colorimeter with photoelectric cells and voltage stabiliser for the determination of silica, iron, aluminium, titanium, and manganese; a reflectometer; an emission spectrograph of the network type, 1·5 metres in diameter, with an arc generator ; a spectrum projector ; a microphotometer ; a 2-kw. voltage stabiliser ; and a cathode oscillograph. Emission spectrography is used in determinations of the minor elements in the materials, particularly small contents of silica, alumina, iron, alkali, alkaline earths, copper, titanium, and vanadium. Two flame-emission spectrophotometers of the Lange type are used for the determination of the alkali content of materials. A photo-cell current-amplifier is used for measuring the intensity of the weak rays.

Electric and gas furnaces are used for high-temperature investigations. A gas furnace with a chamber measuring 22 cm. by 22 cm. by 48 cm. is heated by town gas and air under high pressure, and makes possible a temperature of 1600 deg. C. Two electric furnaces with horizontal chambers are heated by Globar elements and a third by a molybdenum winding in a neutral atmosphere ; they are used for firing small quantities of material up to 1450 deg. C. and for determining melting points in an oxidising atmosphere. For these measurements two cones are placed in the furnace and two quartz lenses project their image on to screens. This apparatus makes it possible to trace by hand the curve of the cone as a function of the furnace temperature (the fusibility curve). A fourth electric furnace with a graphite chamber is under construction ; it will be of the horizontal type with two windows and will be used for measuring the expansion of refractory material up to 1600 deg. C. The variation in the length of the sample is noted with the aid of a differential cathetometer bearing on the ends of the test-piece. A fifth electric furnace with a vertical corundum chamber is heated by granular carbon ; this is used for measuring the collapse of refractory materials under load. A sixth electric furnace has a vertical chamber with triple walls and two windings (rhodium-platinum and kanthal) and enables differential thermal analyses and firing with vigorous quenching to be made. A thermo-balance, a calorimeter for measuring the dissolving temperatures, and a calorimetric bombe (Mahler type) complete the installation for heat investigations.

The mineralogical and geological section is equipped for investigations with transmitted and reflected light. For the first group of observations, there is a large

polarising microscope, a refractometer, a heating plate, a compensator, and a 4-axis plate. The first measurements make it possible to determine, both in thin sections and in the grains, the pleochroism, the optical sign, the system of crystallisation, the angle of the optical axes, and the refraction index. Observations in reflected light are made on polished surfaces. The sample is mounted at a temperature of 120 deg. C. and under a pressure of 1000 kg. per square centimetre, with the aid of an hydraulic press, in a thermo-setting substance, so as to obtain a core of 25 mm. radius and 40 mm. high. The mineral mounted in this way is cut with a diamond saw, then treated with emery of increasing fineness, and finally polished with a felt disc coated with alumina. The surface is acted on by a chemical reagent, and the observations are made by means of a microscope fitted with an opaque illuminator for examination in reflected light. Metallographic examinations are carried out with the use of the same microscope fitted with an "ultropack." A 6-pin integration table permits quantitative mineralogical analyses. A binocular microscope is available for stereoscopic examinations. Black-and-white and coloured microphotographs are taken.

In the radiocrystallographic laboratory is an X-ray generator of the Enraf type, fitted with a sealed tube having two windows and with either a copper or a cobalt anode. The high-tension current is rectified by a kenotron, and the low-tension current (filament heating) is stabilised. Two cameras 11·45 cm. in diameter and a large camera fitted with a quartz plate monochromator make it possible to record powder spectra. A special camera is used for the investigation of diffraction of monocrystals and fibres and for back-reflection examinations. A map of the principal diffraction rays makes it possible to find the mineral sought by measuring the angular distance separating the homologous rays and to convert the distance into reticular distance. This equipment has recently enabled the identification, in fragments of rings formed in the firing zone of rotary kilns, of minerals which had not been classified among the minerals obtained artificially.

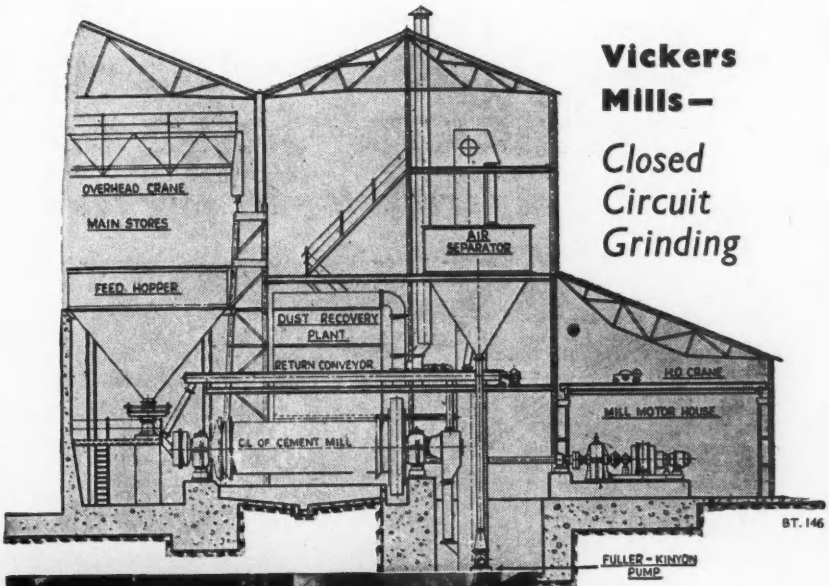
Among the investigations now in progress in the applied research section are the problems of increased efficiency in crushing raw materials, particularly by the installation of hydrocyclones and hydraulic graders; improvement in the thermal efficiency of kilns by the establishment of heat balances on the basis of enthalpy diagrams and quantitative balances of the materials; the utilisation of the dust recovered from kiln gases; and efficiency in grinding clinker.

New Cement Works in Hungary.

WORK has begun on the construction of a new cement factory near Vác, on the river Danube in Hungary. This factory will have double the capacity of a new cement works now nearly completed at Hejöcsaba, which will have a capacity of 1000 tons a day. The rotary kilns in the works at Vác will be 495 ft. long. Existing cement factories in Hungary are being extended and modernised.

British Standards Institution.

THE address of the British Standards Institution is now 2, Park Street, London, W.1. Telephone : Mayfair 9000.



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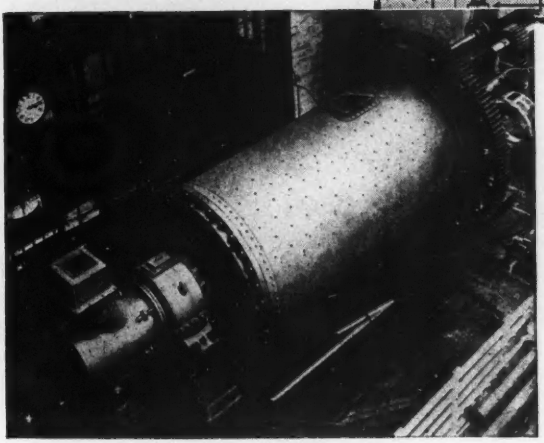

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Goodyear Endless Cord Belts successfully tackle a complicated drive with six changes of direction. This is a sanding machine in the woodwork factory of Craigs Ltd., timber merchants at Widnes. Tough, dependable Goodyear Belts are used exclusively throughout the plant. (NOTE. The guards have been temporarily removed from this drive to facilitate photography.)

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Effect of Sulphates on Cement and Concrete.

Some notes on the effect of sulphates on concrete, and an account of measures taken to protect a culvert which had suffered severe attack, are given by M. Chevrier and M. Houbas in the twelfth volume of the Publications of the International Association for Bridge and Structural Engineering.

The authors state that calcium sulphate in solution combines with the calcium aluminates of hardened Portland cement and forms sulpho-aluminates with accompanying increase of volume. In freshly-mixed mortar these salts produce no apparent expansion while the mortar is wet and may contribute towards hardening, as with metallurgical, super-sulphated, and high-alumina cements. The sulpho-aluminates, when formed by solid salts, develop disintegrating forces. In the case to be described, the calcium sulphate is in solution and reacts with the solid aluminate. Since ordinary Portland cement was used for the culvert, there was no aluminate in solution because of the presence of free lime.

The culvert conveys water from the river Arc to the hydro-electric power station at Avrieux in the French Alps, and is in a tunnel driven through a Triassic rock containing pockets of anhydrite and gypsum. Percolating water dissolves these substances and forms large voids which cause slips and subsidences. Almost as soon as the first stage of the culvert had been completed and lined it was destroyed by ground movements. Good ground was too far away for the line of the culvert to be altered, so an unusual kind of construction was adopted. An egg-shaped reinforced concrete conduit was built inside the heading with about 2 ft. 6 in. clearance between the outside of the conduit and the surface of the rock. The conduit was supported at intervals on concrete pedestals resting on the concrete floor of the tunnel but isolated from it by a few courses of brickwork. In spite of these precautions the conduit was attacked in two ways by sulphate-impregnated water seeping through the rock: (1) The pedestals and the lower parts of the conduit were attacked by the capillary absorption of water from the floor of the tunnel causing complete disintegration of the concrete and corrosion of the reinforcement. (2) The top of the conduit was attacked by water dropping from the roof of the tunnel, which formed an efflorescence, from 4 in. to 6 in. thick, over the surface of the concrete, the aggregate being surrounded by a white oily paste. A light scraping sufficed to expose the reinforcement, of which some bars of 1 in. diameter were completely corroded at places.

Repairs are being carried out with high-alumina cement and it is intended, after cleaning and draining, to surround all the lower part of the conduit with slag-cement concrete to a height of 5 ft. from the floor. Slag cement has been chosen rather than super-sulphated cement to avoid chemical reactions at the joints between the old and new concretes. Super-sulphated cement does not react with other cements, but old Portland cement will be affected by the calcium sulphate (about 15 per cent.) in super-sulphated cement. A hardened super-sulphated cement does not harm Portland cement because the calcium sulphate which it contains is fixed in the form of tricalcium sulpho-aluminate which is non-expansive

and insoluble. During the period of hardening there is, however, a possibility of reaction between them. Normally there is nothing to fear from the capillary movement from Portland cement to super-sulphated cement. The latter cement, being ground extremely finely, forms capillaries in the concrete which are narrower than those in Portland cement concrete ; moreover it absorbs much water whilst hardening. However, if as a result of unfavourable conditions, such as the super-sulphated cement concrete being too permeable and being under hydrostatic pressure, movement may take place in the opposite direction. The dampness in the tunnel assists the hardening of this cement, and its strength need not be great as it will not be heavily loaded.

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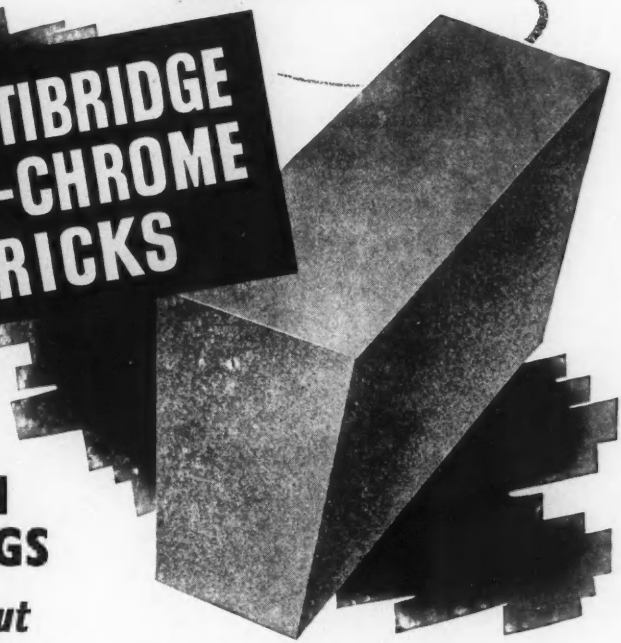

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Heats of Hydration and Pozzolana Content of Portland-pozzolana Cements.

In the Journal of Research of the National Bureau of Standards for August, 1952, Mr. Edwin S. Newman and Mr. Lansing S. Wells describe research work on mixtures of Portland cement and pozzolana.

The authors point out that many methods of testing cement and concrete are not affected by the presence of pozzolana, which contains a large percentage of silica. The measurement of the heat of hardening of Portland-pozzolana cement by the heat-of-solution procedure, however, is less reliable than the measurement for ordinary Portland cement because of the presence of material not readily soluble in acid. The heat-of-solution method depends on the measurement of the heats of solution in acid of a sample of dry cement and of a corresponding sample of hardened paste ; the difference between the two heats of solution is the heat of hardening of the cement paste. A mixture of nitric and hydrofluoric acids, in which nearly all Portland cements dissolve rapidly and completely, is used. Considerable portions of many pozzolanas, however, are not readily soluble, and for even nearly complete solution far more time would be required than is desirable in the usual procedure for Portland cement. The Bureau has occasionally measured the approximate heat of solution or hydration of pozzolana cements. This paper presents the results of tests made by methods devised to reduce the effect of the material that is not easily soluble.

In addition to the problem of measuring the heat of hydration of Portland-pozzolana cements, the authors continue, there also exists, perhaps more urgently, the problem of determining the pozzolana content of such cements. In the course of calorimetric measurements, it was observed that part of each cement-pozzolana mixture was undissolved. It was also observed that the heats of solution of the mixtures, as well as the percentage of undissolved material, were related to the pozzolana content. So that these data might not be lost, they have been included in this paper, and their application to the measurement of the pozzolana content of Portland-pozzolana cements is discussed.

Two calorimeters were used, namely, (1) an isothermal-jacket precision-type calorimeter, and (2) the vacuum-flask calorimeter required by the A.S.T.M. and the Federal Specification Board for the routine determination of the heat of hydration of Portland cement. The isothermal-jacket calorimeter is equipped with a controlled-temperature water-bath, a platinum-resistance thermometer, and electrical and time-measuring instruments for determining with high precision the temperature rise and the electrical energy of calibration. The vacuum-flask calorimeter consists only of a vacuum flask, a stirrer driven by a synchronous motor, and a Beckmann thermometer. No attempt is made to surround it with a constant-temperature environment, and it is subject to lags and errors arising from changes in the laboratory temperature. Consequently, although it is much less expensive and easier to operate than the isothermal-jacket calorimeter, the vacuum-flask calorimeter is considerably less precise. Because of the difference

in the operation of these instruments and in the application of their characteristics to the problem, they are discussed separately.

Methods of measuring the approximate heat of solution in acid of Portland cement-pozzolana mixtures, and examples of the estimation of the heat of hydration of these cements, are given. Determinations of the amount of material undissolved in the calorimeter, as well as the heats of solution, were applied to the problem of determining the composition of mixtures of Portland cement and pozzolana. Data are presented for the calculation of the heat capacity of the vacuum-flask calorimeter with amounts of hydrofluoric acid other than the 8-millilitre quantity used in measuring the heat of hydration of Portland cement by the standard method.

The Cement Industry in Pakistan.

AT present the production of cement in Pakistan is 550,000 tons a year and the consumption is about 900,000 tons. The government has been recommended by the Council of Industries of Pakistan to increase the production of cement to 1,000,000 tons a year within the next two years, so that there will be a surplus after supplying all the country's requirements.

New Kiln for Rhodesia.

THE Premier Portland Cement Co., Ltd., is to install a new rotary kiln at its Bulawayo factory. The plant will then comprise four kilns and will have a capacity of about 260,000 tons a year.

Cement Plant for Poland.

AN agreement for the exchange of goods between Poland and Denmark during the period March 1953 to February 1954 includes the despatch of cement plant valued at 300,000 Danish Kroner from Denmark to Poland.

New Cement Plant for Syria.

THE cement works at Aleppo is to be extended, and an order for the new plant has been placed in Germany.

Cement Production in El Salvador.

THE cement factory at Acajtla is now in production. The capacity is 4,200 tons a month.

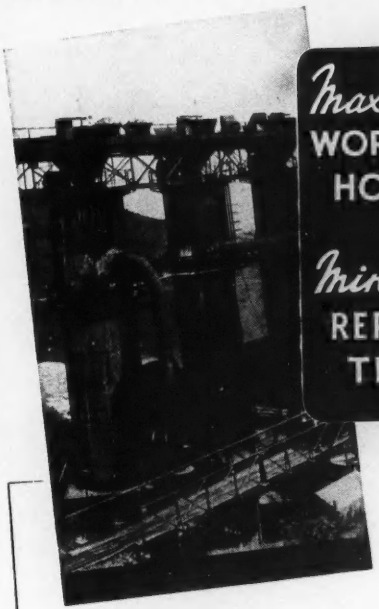
Cement Production in Denmark.

THE Danish Co-operative Cement Works produced 200,000 tons of cement in the year 1952; this is an increase of 17,000 tons over the production in 1951. Exports of cement from Denmark in the first four months of 1953 were valued at Kr. 25,000,000 compared with Kr. 15,000,000 in the same period in 1952.

Cement Production in Turkey.

THE Turkish Industrial Development Bank is to grant loans for the erection of cement works. It is hoped to increase the capacity of the industry from 900,000 tons to 2,500,000 tons by the end of the year 1956.

LIME KILNS



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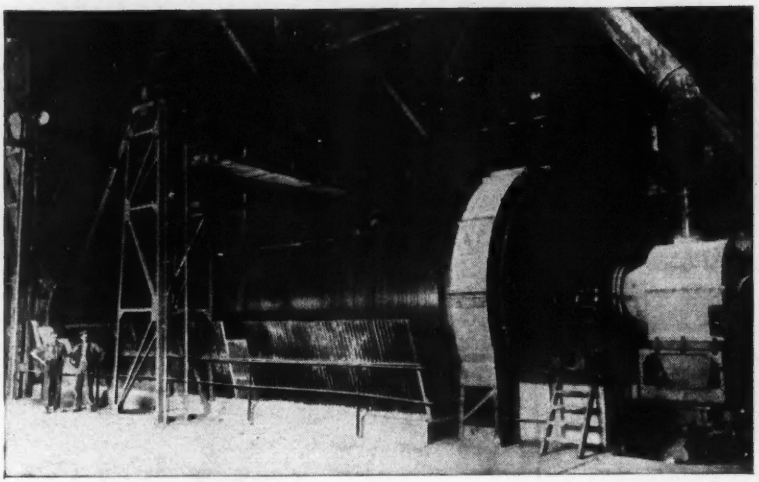

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Printed in Great Britain by CORNWALL PRESS LTD., 1-6, Paris Garden, Stamford Street, London, S.E.1.
Published by CONCRETE PUBLICATIONS, LTD., 14, Dartmouth Street, London, S.W.1, England